

A Summary of Revisions in the New D1.1:2010, Structural Welding Code – Steel

Poised to go on a five-year publication cycle, the 2010 Code has some significant changes explained

BY JOHN L. GAYLER AND DONALD D. RAGER

The AWS D1 Structural Welding Committee Chair Duane Miller announced in his editorial in the March 2010 issue of the *Welding Journal* that D1.1 would move to a five-year publication cycle. This will be the first time since 1986 that D1.1 will not be published on a two-year cycle. Aside from this significant change in publication frequency, the D1.1:2010 edition has several other changes that the Structural Welding Committee feels the industry will welcome. Described here are the most significant changes from the 2008 to the 2010 editions of D1.1. Some explanations and rationale behind a few noted changes are also included.

Understanding a New Table

The most noticeable change that most users of the code will see in the 2010 edition is the addition of a new table in the prequalification section. The new table, Table 3.8, lists which variables must be included on a prequalified WPS, and how changes beyond certain parameters would require a new or revised WPS to be written. Subclause 3.6 introduces the new table, and users of the code will notice that this subclause no longer references Clause 4, Table 4.5, for the requirements and the ranges for amperage, voltage, travel speed, and shielding gas flow rate. The code also includes commentary on the new Table 3.8 that helps clarify many open questions on prequalified procedures and explains how to use the new table. Code users should be aware that some of the prequalification ranges of the four variables mentioned previously have also been revised with the establishment of this new table. In addition, specific ranges have been placed on other variables not required in previous editions of the code

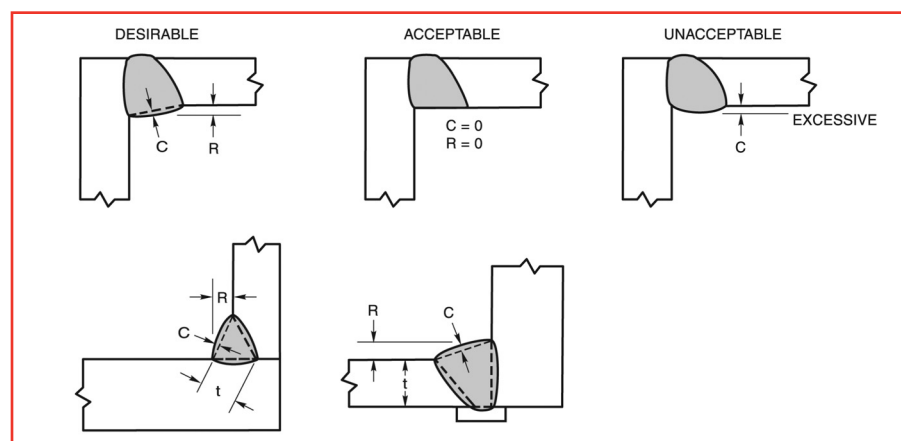


Fig. 1 — Groove weld profiles inside corner joints.

such as wire feed speed and submerged arc welding electrode parameters, to name two. The listing of the other variables in the new table is not a change in the requirements of previous editions of the code in writing a prequalified WPS, rather they are a clarification that changes to those variables require writing a new or revised prequalified WPS. It is the Structural Welding Committee's consensus that reorganization and consolidation of the instructions on how to establish a prequalified WPS will assist code users.

Weld Profiles

Probably the next greatest change in the code is the redrafting of the well-known weld profile figures, Figure 5.4. The number of illustrations has been increased to better clarify what weld profiles are required in different types of weld joints. A new table accompanying the redrawn figure lists weld profile dimension requirements, such as weld reinforcement and al-

lowable convexity. These requirements are categorized into four schedules (Schedule A, Schedule B, Schedule C, and Schedule D) in the new table as a means to separate different criteria depending on the type of weld and type of weld joint to be welded. Along with redrafting these figures, the code committee has made slight modifications to the code's requirements such as larger weld reinforcement is now permitted for welds in thicker members. By expanding Figure 5.4, the code now shows specific weld profiles for groove welds in corner and T-joints, shelf bars, and welds between butt joint welded members of unequal thickness. Some of the new weld profiles are shown in Figs. 1–4.

New Thermal Cut Roughness Requirements

Also of note is the elimination of specific thermal cut roughness values as given in previous editions in Subclause 5.15.4.3

JOHN L. GAYLER (gayler@aws.org) is director, national standards activities, American Welding Society, Miami, Fla.
DONALD D. RAGER (ddrager@ragerconsulting.com) is president, Rager Consulting, Inc., Coles Point, Va.

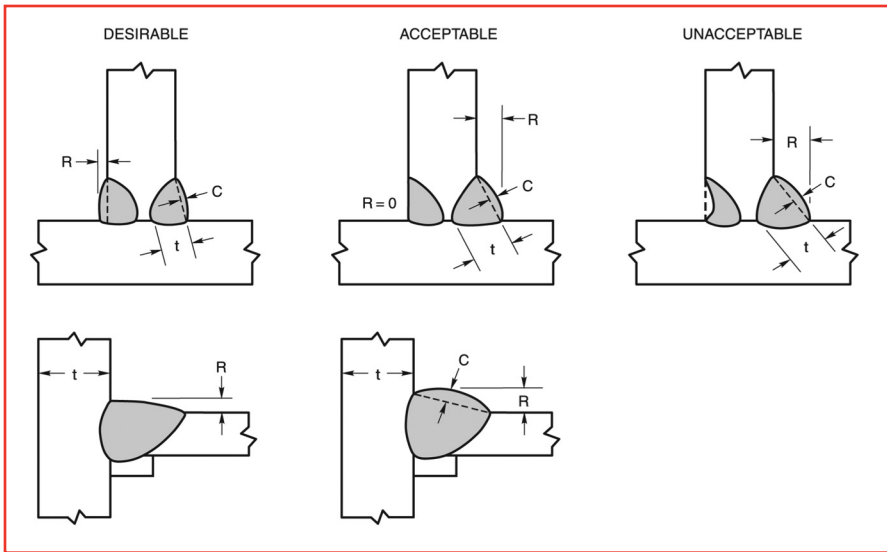


Fig. 2 — Groove weld profiles in T-joints.

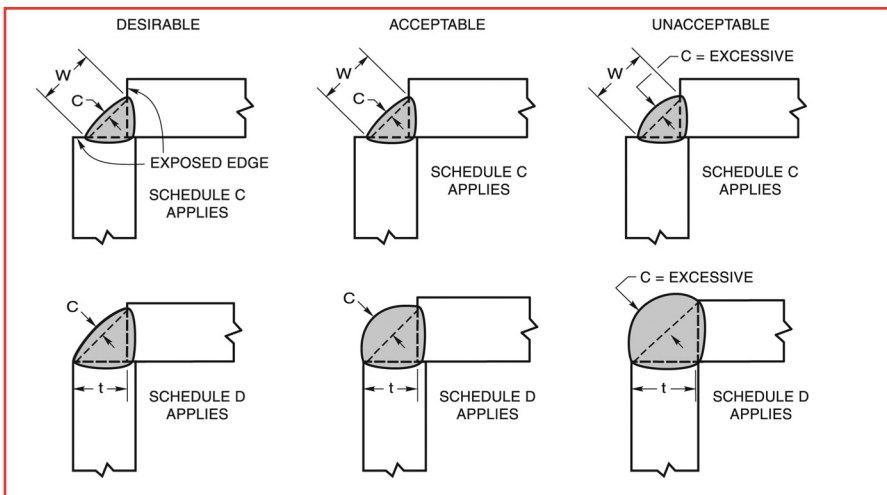


Fig. 3 — Fillet weld profiles for outside corner joints.

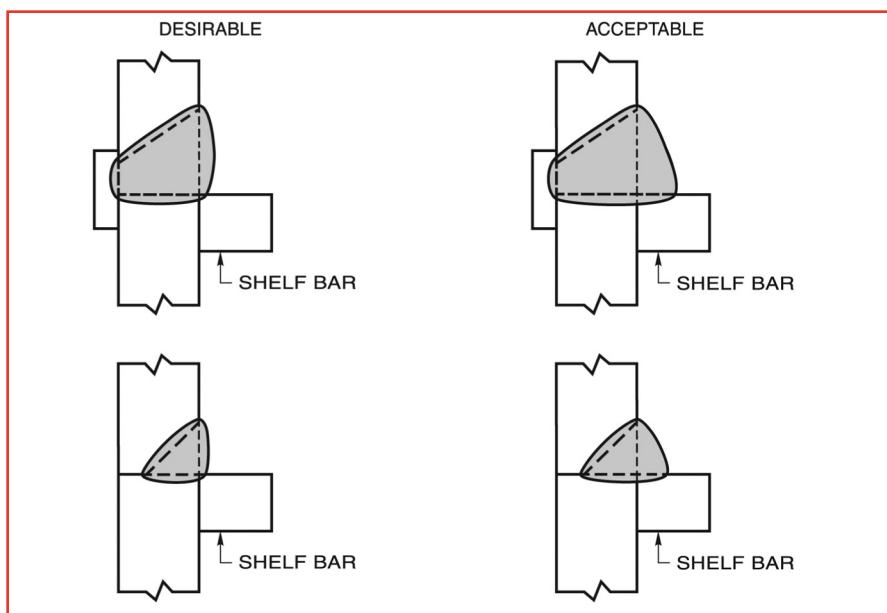


Fig. 4 — Typical shelf bar details.

and measured to the requirements of ASME B46.1. Now, the new thermal cut roughness values are tied solely to the comparison samples found in AWS C4.1, *Oxygen Cutting Surface Roughness Gauge*. The requirements in previous code editions have been deemed overly prescriptive, and the code committee thought it appropriate to change the requirements to a comparative standard.

Access Holes and Beam Copes

Requirements for weld access holes and beam copes are revised in this edition. Weld access hole dimensions have been modified, and mandatory minimum and recommended maximum depth dimensions of access holes have been set to prevent those that are unnecessarily deep or that are too shallow. The new code also permits a smaller radius on reentrant corners in connection material and beam copes, as the 1-in. (25-mm) radius requirement of previous codes is not supported by research and is excessive for many connection details. Beam copes in galvanized sections must now be ground to bright metal to reduce the possibility of cracking. Preheating before thermal cutting of beam copes and weld access holes in heavy shapes is now mandatory to reduce the formation of a hard surface layer and the tendency to initiate cracks.

Revised Backing Requirements

The code committee has revised the requirements for backing, found in Subclause 5.10, to allow for discontinuous backing in some limited statically loaded hollow structural steel (HSS) applications. There are limiting factors including diameter and wall thickness of the HSS shape that control when noncontinuous backing may be permitted, and there are, of course, a few code exceptions to these limitations.

Prequalification and Qualification

Under Subclause 3.3, the matching and undermatching table has been revised to clarify that a filler metal chosen for joining a combination of two different strength base materials need only match either of the two materials for the selection to be considered “matching.” Likewise, “undermatching” was clarified to mean a selection of filler metal whose strength is less than either of the base metals being joined.

The requirements of Subclause 3.7.3 have been expanded to include all weath-

ering steels, not just ASTM A 588. ASTM A 709 HPS50W has been added as a prequalified material in Group II of Table 3.1 and Group B of Table 3.2. ASTM A1043 Grades 36 and 50 have been added to Table 4.9.

A new subclause under 3.13 (CJP Groove Weld Requirements) has been added to clarify that only steel backing is considered prequalified for nontubular welds made from one side only. The use of material other than steel for backing in a one-sided nontubular weld may be used if qualified by test in accordance with Clause 4 (Qualification).

The code clarifies by revisions to 4.35.3 that if an existing qualified WPS is to be used for applications requiring impacts but CVN tests were not done during the initial qualification of that WPS then a procedure test plate needs to be performed but only impact tests are required to be run. The other tests associated with a WPS being qualified by test, having been completed during the original WPS Qualification need not be repeated.

Stud Size

A $\frac{3}{8}$ -in. (10-mm) stud size has been added to the code, and the tolerances on existing stud sizes have been revised to

allow manufacturers to produce products that comply with both international and American standards. These tolerance changes do not adversely affect the physical or mechanical properties of the studs.

Commentary on ESW, EGW, and UT

New commentary on electroslag and electrogas welding (ESW and EGW) has been added as assistance to users in implementing these welding processes. Also, commentary to alert users when applying ESW and EGW on quench and tempered steels, thermomechanical control processed steel, and precipitation hardened steels subjected to cyclic loading applications has been added. Both potential and current users of these processes should read through the new commentary to better understand potential pitfalls and possible remedies suggested there.

Additional commentary has been added to emphasize that the ultrasonic testing (UT) acceptance criteria shown in Tables 6.2 and 6.3 have been established within specific testing parameters and that using testing equipment or procedures, such as transducers of a different size or angle shown in these tables, may invalidate the results.

Other Changes

- The code no longer requires the Type 1 IIW UT Reference Block; any of the IIW “type” blocks may be used.

- Cracks or bursts in headed studs are now covered in detail, and the maximum length of these cracks has been established.

- A definition for “tubular” has been added to Annex K along with a revised definition for “pipe.”

- Annex N, Form N-3 (ESW/EGW) has been completely revised.

- Some guidance has been added to the introductory page of the commentary to assist users in distinguishing commentary on code from items supporting commentary.

- The words “thorough fusion” have been changed to “complete fusion” in Table 6.1 (visual acceptance criteria) to match the terminology used in AWS A3.0, *Standard Welding Terms and Definitions*.

Many other changes, mostly minor, have been made to this new edition of the D1.1 Code. The new foreword has a comprehensive but succinct list of all changes. Most changes are also identified in the published code by underlined text or vertical lines in the margins of the page. ♦



AWS

**MEMBER
DISCOUNTS**
AVAILABLE HERE

Find more than 400 distributor locations that offer EXCLUSIVE DISCOUNTS to American Welding Society Members.

Take advantage of an exclusive benefit for AWS Members... the GAWDA / AWS Discount Program. AWS Members receive Members'-only discounts on welding equipment and tools of the trade by participating distributors. Currently, there are more than 400 participating locations nationwide.

Please note: discounts and items discounted are at the sole discretion of each distributor/branch. For discount amount, please contact the company/branch directly.



Check out all participating locations at www.aws.org/distdiscounts